



## **Brand!**

Præsentation ved lancering af Matematiske Horisonter

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# Brand!

## Matematiske Horisonter

### Seminar

27. august, 2009

Steen Markvorsen

DTU Matematik



# Synopsis

## 1 Fænomenet

# Synopsis

- 1 Fænomenet
- 2 Modellering



# Synopsis

- 1 Fænomenet
- 2 Modellering
- 3 Øvelser, projekter, forskning

# Udbredelse



# Udbredelse



# Udbredelse



Californien 2008

# Udbredelse



Santa Cruz 2009

# Udbredelse



Athen i går

# Elliptiske brandzoner



# Elliptiske brandzoner





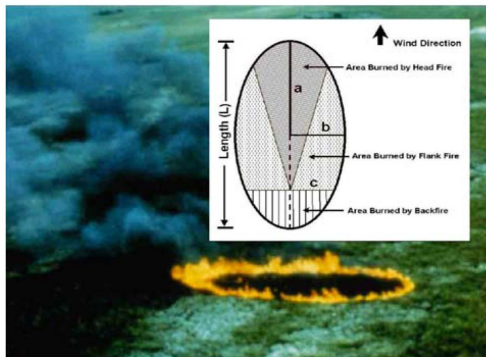
# Elliptiske brandzoner



# Elliptiske brandzoner



# Elliptiske brandzoner



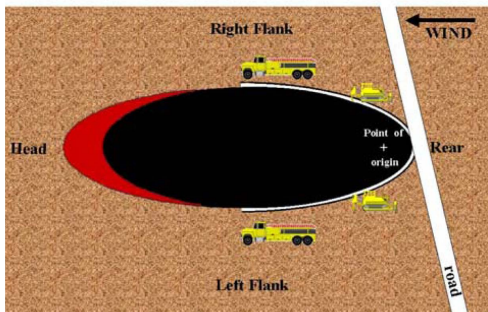
# Elliptiske brandzoner



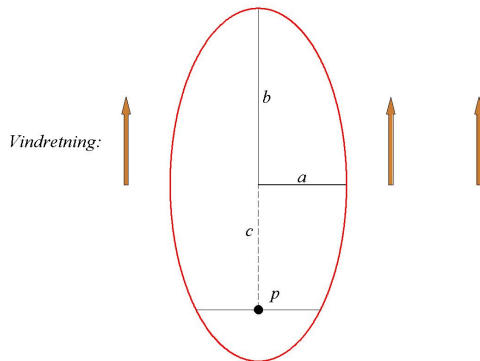
Figure 4. Free-burning fire growth projected for conditions similar to those experienced during the 1991 Tikokino Fire using the *Field Guide*.

# Elliptiske brandzoner

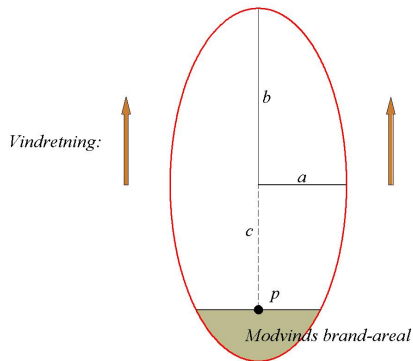
## DIRECT ATTACK FLANKING ACTION



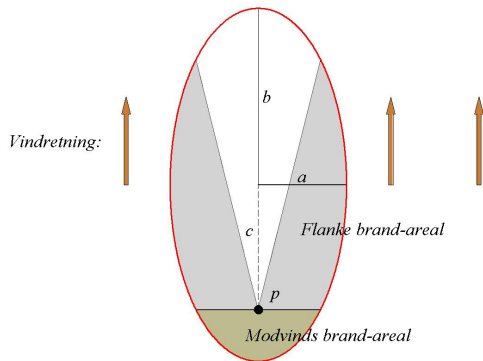
# Elliptiske brandzoner



# Elliptiske brandzoner

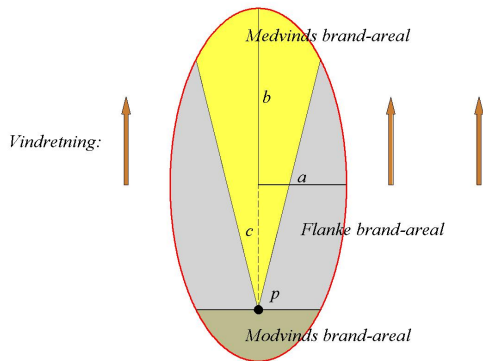


# Elliptiske brandzoner

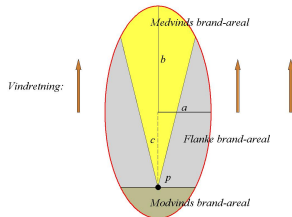




# Elliptiske brandzoner



# Elliptisk brandzone udbredelse: Model

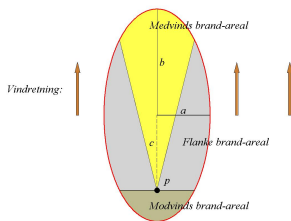


## Model med konstant vind

$$x(t, \phi) = a \cdot t \cdot \cos(\phi)$$

$$y(t, \phi) = b \cdot t \cdot \sin(\phi) + c \cdot t$$

# Elliptisk brandzone udbredelse: Model



## Definition

$$v = b + c \quad (\text{Medvinds-farten})$$

$$u = a \quad (\text{Flanke-parallelvinds-farten})$$

$$w = b - c \quad (\text{Modvinds-farten}) \quad ,$$

og  $a/b$  afhænger kun af vindhastigheden.

# Elliptisk brandzone udbredelse: Model OK iht. CFFBPS

*"The Canadian Forest Fire Behaviour Prediction System (CFFBPS) assumes elliptical growth and has documented values of  $u$ ,  $v$ , and  $w$  for a very large set of constant parameters affecting a fire. It has also been observed that, within certain limits, the ratio  $a/b$  is a function of wind speed only; this is also an assumption of the CFFBPS."*

# Tids-foliering, animationer

Udbredelse uden vind

# Tids-foliering, animationer

Udbredelse med vind

# Tids-foliering, animationer

Uden vind omkring ikke-konveks sø

# Tids-foliering, animationer

Med vind omkring ikke-konveks sø



# Tids-foliering, animationer

Uden vind men med *variabel* vegetation

# Tids-foliering, animationer

Uden vind, *variabel* vegetation, geodætisk spray

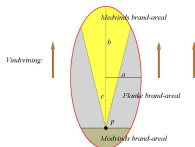
# Geodætisk spray i konform Mercator kort

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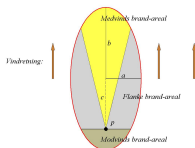
# Konklusion

Simple første modeller for et yderst komplekst fænomen



# Konklusion

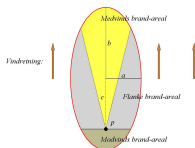
Simple første modeller for et yderst komplekst fænomen



- 1 Det nytter, det rykker!

# Konklusion

Simple første modeller for et yderst komplekst fænomen

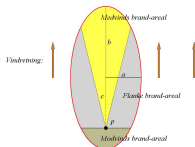


- 1 Det nytter, det rykker!
- 2 Så sker der noget!



# Konklusion

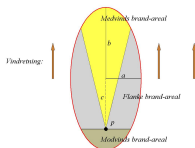
Simple første modeller for et yderst komplekst fænomen



- 1 Det nytter, det rykker!
- 2 Så sker der noget!
- 3 Opgaver, projekter og forskning i Geometrisk Analyse!

# Konklusion

Simple første modeller for et yderst komplekst fænomen



- 1 Det nytter, det rykker!
- 2 Så sker der noget!
- 3 Opgaver, projekter og forskning i Geometrisk Analyse!

Tak for opmærksomheden!